

The Jordan Valley Authority Cost/Tariff Model

Operation and Maintenance and Capital Costs

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FORWARD

Collaborative Approaches for Resolving Water Issues



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CHAPTER ONE

INTRODUCTION

The Jordan Valley Authority

The Jordan Valley Authority (JVA) is entering a period of transition now that its initial mission to support the settlement and development of the Jordan Valley has been substantially accomplished. Significant land area is under irrigation, and a viable social infrastructure of roads, schools, and clinics has been developed. In recent years, other changes have presented JVA with new opportunities and challenges. The increasing need to reallocate water from rural to urban uses has limited irrigation possibilities and increased the demand for additional water supplies. The use of poorer-quality wastewater return flows and brackish water supplies has affected farm production, and other non-irrigation activities, such as development of tourism infrastructure, have risen in importance to the Kingdom. Cost-of-service recovery, funding, and commercialization issues have become increasingly prominent matters as well. Maintaining and improving service levels, and introducing institutional changes to carry them out, have intensified JVA's need for flexible and sophisticated analytical and policy tools for utility and financial planning. They will permit the Authority to respond better to future needs of the country.

USAID's FORWARD Project

In 1996, the United States Agency for International Development (USAID) initiated the Fostering the Resolution of Water Resources Disputes Project (FORWARD). It was designed to combine technical expertise and collaborative problem-solving approaches to address problematic water resource issues more effectively.

Strictly technical efforts often fail to address the underlying issues that impede agreement by the parties involved. A key aspect of the FORWARD approach is to work closely with stakeholders to foster on-going participation and agreement so conflicts can be avoided and implementation measures can be carried out.

FORWARD's efforts in Jordan began in late 1996 when the government identified the cost/tariff issue as a key, but difficult, policy matter in the water sector. This led to a design mission in April 1997 to develop a financial planning cost/tariff model for the JVA, contracting in August 1997, and completion of the FORWARD efforts on the JVA model in August 1998.

The FORWARD program was able to build upon existing data and previous assessments performed by JVA and others. Information concerning prior Authority budgets and financial audits, water monitoring and flow data, electrical consumption and pumping records were accessed as data inputs or considerations in designing the model.

Goals and Objectives of the Cost/Tariff Model

The goal of developing the JVA cost/tariff model is improve the Authority's short- and long-term financial planning and budgeting through the provision of powerful, but user-friendly, analytical tools.

Objectives of this effort were to:

- Assess the cost of delivering water to the Jordan Valley under both present and more efficient conditions;
- Assess the viability of alternative management measures to improve efficiency; and
- Use costs as a basis for assisting JVA in restructuring tariffs for farmers in ways that are sensitive to a number of factors, including variations of seasonal flows and water quality.

The model was not intended to be a monthly cash flow accounting model or an engineering systems operations model, although it can be put to a variety of planning and evaluation uses.

CHAPTER TWO

COLLABORATIVE PLANNING PROCESS AND AGREEMENTS

The Collaborative Planning Process

FORWARD developed the Analytical and Policy Tools for Costing and Tariffs workplan with MWI and JVA staff. The cost/tariff model is the main tool for the costing and tariff program. The nature of the model and its use and design was agreed to by the senior MWI and JVA staff.

In August 1997, MWI, JVA, and FORWARD met to initiate JVA program. The meeting was an opportunity to identify the technical issues and agree on the process details of collaborative planning throughout the course of the program. In that meeting coordination levels and channels were identified as follows:

- Technical staff in the Amman and the valley to build consensus on basic data of costing and revenues;
- Technical Working Group (TWG) from JVA to follow on the project progress, participate in the data interpretation and analysis, and provide advice to resolve technical issues; and
- Policy and decision makers to agree on policy issues related to evaluating multiple tariff and efficiency scenarios such as the overall cost recovery, the ability of customers to pay, who should pay for public interest expenses, and determine the applicability of efficiency criteria and its relevancy to JVA operations.

Coordination at the three levels was carried out on a continuous basis throughout the modeling effort. Monthly meetings were carried out with the Technical Working Group to review progress and plan activities.

Major Issues and Agreements within the Process

Billing and Collection

JVA has an automated billing system that tracks water sales to JVA customers and farmers. However, collection is not tracked on a seasonal or annual basis. The system only shows the outstanding debts of farmers. By law, JVA can cut water supplies to farmers who are in arrears and can also sue them. JVA staff suggested that FORWARD include only the billing data in the model. FORWARD discussed the issue with JVA and explained that collection is an efficiency measure and could reflect on the financial performance of the Authority. JVA and FORWARD agreed to include percentages for the collected bills in the model so that evaluation of the utility performance and financial scenarios could be pursued more realistically.

Allocation of Costs among Directorates and Cost Centers

In August, JVA and FORWARD agreed to develop discrete cost centers at the primary system, secondary system, King Abdullah Canal (KAC), and pumping station levels. The FORWARD team tried to collect the costing information for these cost centers, but JVA does not keep the cost records as requested. FORWARD worked with JVA staff to allocate the costs from the JVA operation and maintenance (O&M) budget into water and non-water activities. Then costs were allocated to different directorates and system levels using assumptions. It was also agreed that once JVA has the Financial Accounting System (FAS) functioning, real figures will replace the assumptions in the model.

Debt Service Allocation of JVA Capital Investment to Cost Centers

In August, JVA and FORWARD decided to use the debt service method to calculate the capital cost component of JVA investment. The model is designed to look into investment since 1978 as well as new investment in the next five years. The capital cost component could be activated or deactivated for its inclusion.

JVA investment projects are spread over different levels of the irrigation systems. Some projects have construction components on all system levels including the primary system, secondary system, and KAC. Allocation of capital expenditures to JVA system components is not clearly defined. FORWARD and JVA worked together to estimate the capital components of the projects and allocated their debt service to discrete cost centers.

Model Design to Reflect the Cost of Water Transfer at Deir Alla Intake to Amman

The Water Authority of Jordan (WAJ) receives water supplies from the Jordan Valley. King Abdullah Canal carries the water from different sources including the Yarmouk River, the Wadi Arab Dam and the North Conveyor into the Jordan Valley. Part of KAC water is being pumped to Amman for municipal use.

In August, JVA, WAJ, and MWI agreed that the JVA model should address the issue of the Deir Alla transfer to Amman. It was also agreed that the model should have a separate sheet for Deir Alla.

The minister, JVA, and FORWARD agreed on the costing methodology and the direct cost items in the sheet. Another cost item category, lost opportunity cost, was also included in the Deir Alla sheet.

CHAPTER THREE

MODEL OVERVIEW

Uses of the Model

The JVA cost/tariff model provides the capability to:

- Examine and forecast the demand for irrigation and non-irrigation water service;
- Compare customer demands against available system capacity;
- Allow for rationing or full provision of service;
- Calculate the annual cost of service at various cost centers in the system;
- Aggregate those costs in various useful ways;
- Specify different types and levels of utility tariffs and fees;
- Model different levels of revenue recovery; and
- Explore planning and policy parameters for what-if type analyses on the utilities operations and finances.

Structure of the Jordan Valley Authority

Cost-based models must take into account the organization of the entity since budgeting and monitoring are typically structured along these lines. They should also consider the structure of the supply and delivery system at various discrete points since they affect the cost of service. This information is useful in cost center analyses and tariff setting.

Institutional Organization

The Jordan Valley Authority is organized into directorates which perform a specialty service or provide water service delivery to a geographic area within the Jordan Valley. Although JVA provides both water and non-water services to the Jordan Valley, FORWARD efforts focused on the water-related activities directly associated with providing water service including water-related costs for:

- The North, Central, South and Southern Ghors directorates—providing delivery service to farms;

- The Central O&M Directorate—providing operation and maintenance to the King Abdullah Canal, certain other primary supply facilities, and pump stations;
- The Dams Directorate—providing planning and O&M for large dams and reservoirs; and
- The Workshop Directorate—providing centralized workshop maintenance and repair services.

Non-water costs and the costs of JVA senior management in Amman were excluded from the model. They were allocated to national costs to reflect the Authority's overall mission of integrated development in the Jordan Valley.

Water System

For purposes of cost-center evaluation, possible tariff setting, and commercialization assessment, the JVA water supply system was subdivided into four major components:

- Primary supply system, including dams, major conveyors into the King Abdullah Canal, and diversion weirs;
- King Abdullah Canal primary conveyance system;
- Pumping stations off the canal; and
- Secondary delivery system, which delivers irrigation water from the KAC or from major sources to the farm units.

The primary supply system was further delineated into individual major sources of supply. Data for the KAC were developed to determine the costs at various key points along the canal. The pumping stations and secondary delivery systems were separately identified to allow for determination of possible wholesale costs of supplying water to those points under commercialization planning scenarios.

For purposes of irrigation demand forecasting, supply allocations decisions, and possible tariff setting, JVA water demands were subdivided into ten stage offices and the Southern Ghor Directorate. For further water demand and tariff-setting analyses, varying irrigation application rates were specified for the four different geographical climatic zones of the JVA from north to south. Four major water quality classifications were also identified for evaluation of effects on farm production and consideration of specialty tariffs:

- Quality 1—higher quality water
- Quality 2—mixed fresh King Abdallah Canal and King Talal Reservoir (KTR) waters

- Quality 3—King Talal Reservoir water only
- Quality 4—mixed fresh KAC, KTR, and Karamah waters

Schematic drawings of the Jordan Valley irrigation system are shown in Figures 1 through 3 illustrating the components and demand centers.

Structure of the Model

The JVA model was developed using Microsoft Excel 7.0 electronic 3-D spreadsheet software to permit an easy understanding of the model's organization, calculations, and links, and to facilitate what-if analyses of different planning scenarios. The model comprises one workbook file and is subdivided into logical planning, engineering, and financial components, assigned to one or more worksheets (pages) of the workbook.

FIGURE 1
SCHEMATIC OF JORDAN VALLEY DEMAND AND SUPPLY CENTERS
NORTH DIRECTORATE

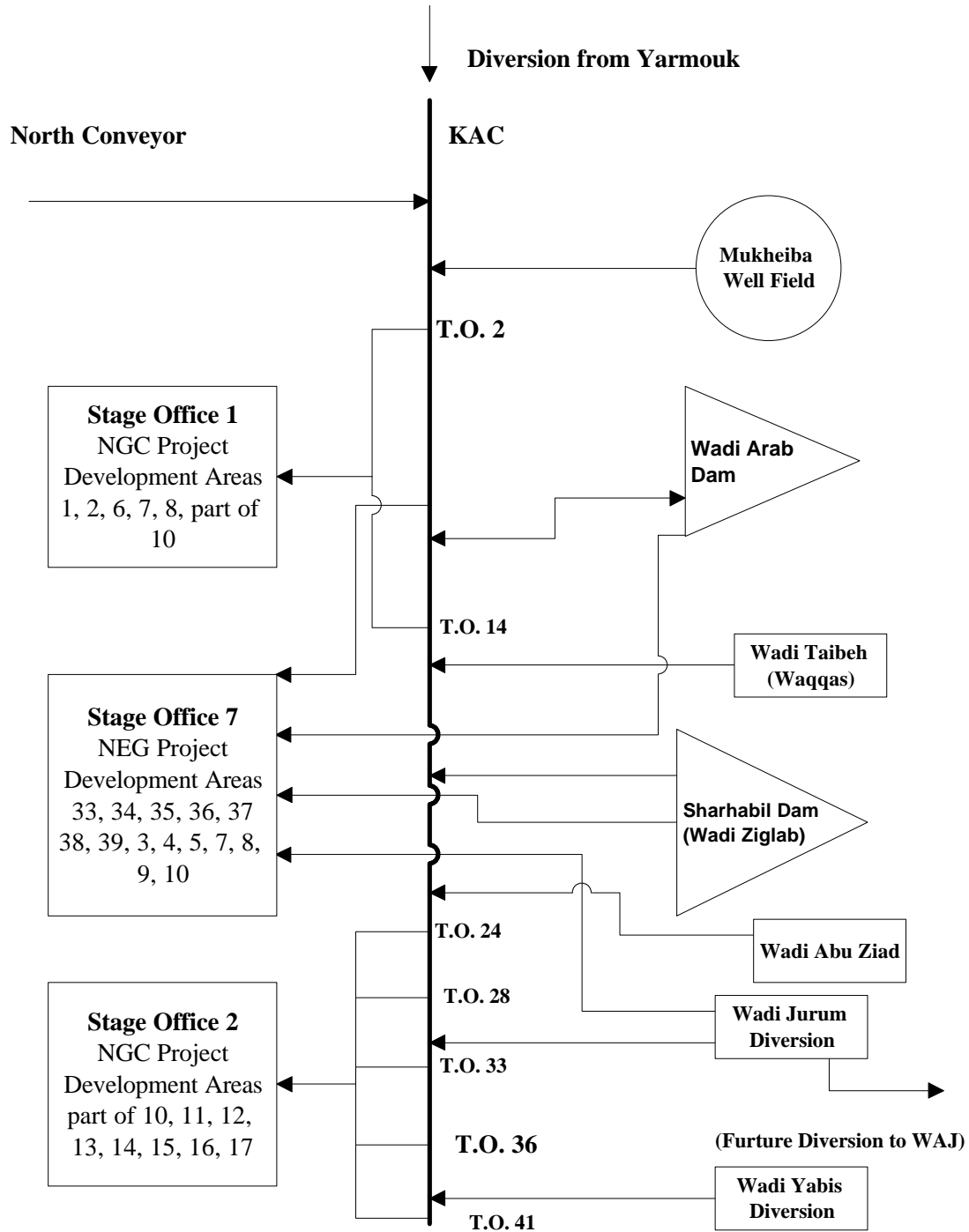


FIGURE 2
SCHEMATIC OF JORDAN VALLEY DEMAND AND SUPPLY CENTERS

MIDDLE DIRECTORATE

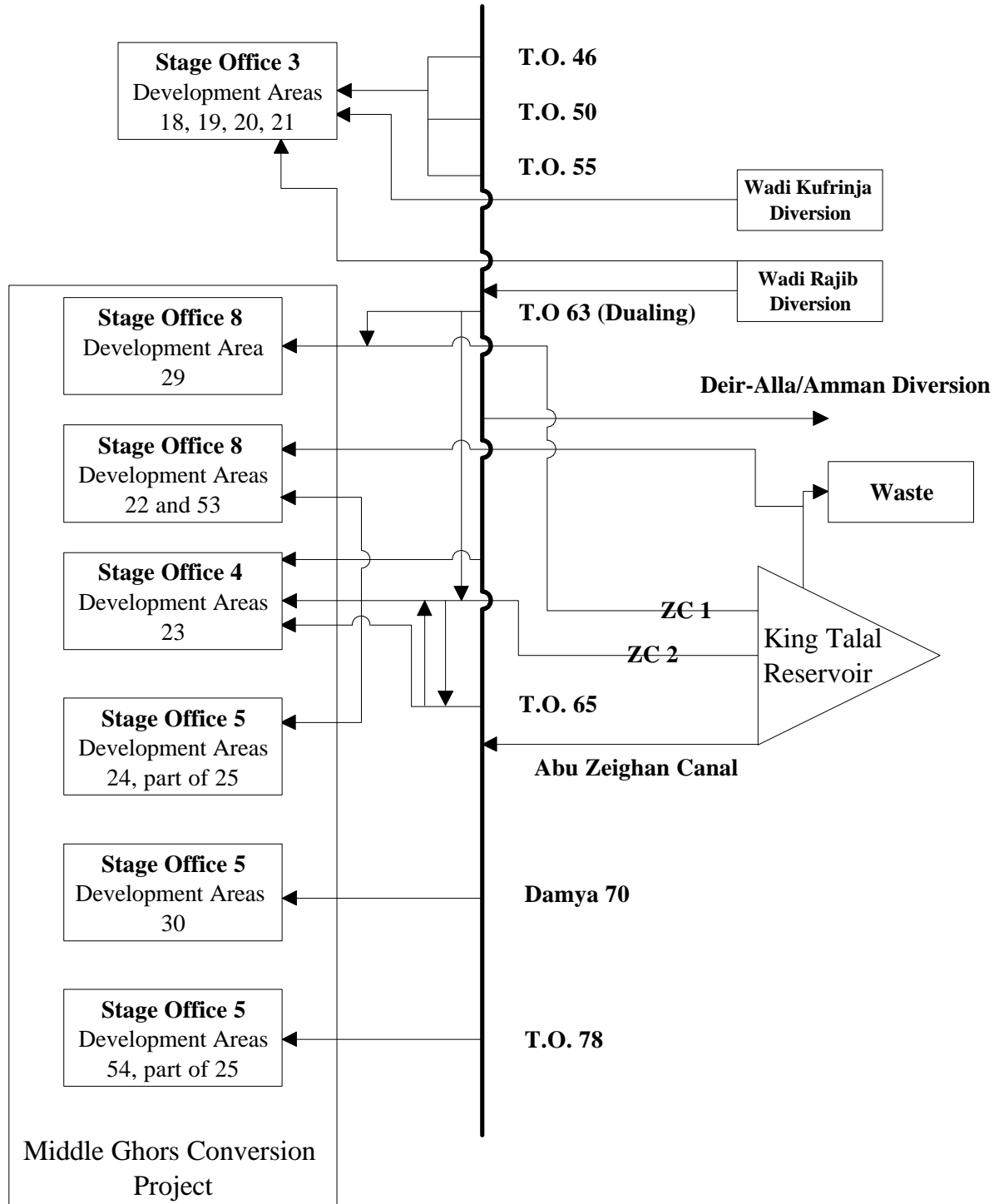
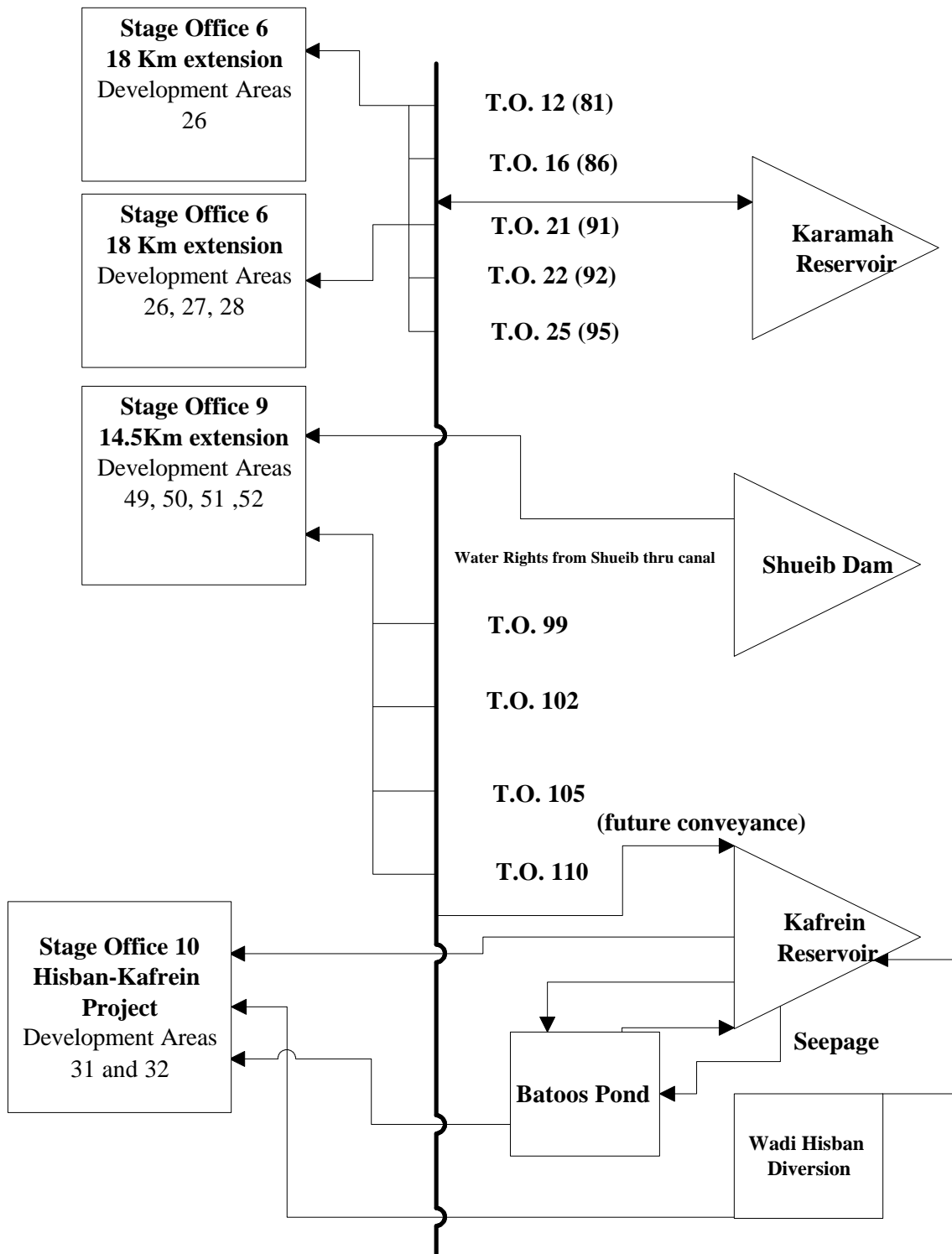


FIGURE 3
SCHEMATIC OF JORDAN VALLEY DEMAND AND SUPPLY CENTERS

SOUTH DIRECTORATE



Data links exist between individual components (worksheets) within the model. To the extent possible, care was taken in the model design to develop standard cost accounts and model parameters for each cost center and to structure tables, where possible, in a similar location and format. Two years of historical data are provided in the model for reference and benchmarking purposes, and the forecast timeframe is five years into the future.

Major Components

At its most simple level, the JVA model contains four major analytical components or processes that represent either a single worksheet or groups of worksheets within the model:

- **Financial/Model Parameters.** Summary financial information in tabular and graphical form as well as global model parameters that, when changed, can have widespread effects upon the model's calculations and results. This component also allows for the cost of service to be considered with or without a capital cost consideration.
- **Planning.** Various underlying factors and calculations affecting system growth, water demand by stage office, water supply availability, and how water supplies are allocated in either surplus or deficit conditions.
- **Revenues.** Calculations that generate system revenue by stage office, on a seasonal basis, or according to water quality. This module also considers miscellaneous fees, as well as other adjustments to revenue.
- **Costs.** Various-defined cost centers of the utility, the local parameters that uniquely affect that cost center's expenses, the calculation of costs for that cost center, and various aggregations of cost centers used for tariff considerations.

Model Flow

While the JVA model can be simply categorized into the four major components listed above, the underlying details are somewhat more complicated with a larger number of sub-components addressing various planning, engineering or financial issues and data flowing from one table and portion of the model to another.

While input parameters affecting the calculations are present at various steps throughout the model, it essentially begins with irrigated areas and theoretical cropping requirements to reach projected water demand. The projected demand is then compared to available water supplies at stage office level, and decisions are made on how to ration supplies during shortages or how to allocate or draw upon various supplies during surplus conditions. These are then used as key inputs to determine the expenses of variously defined cost centers.

JVA can enter data related to each cost center in the model and allocate the common expenses to cost centers through a certain percentage of allocation that can be specified by JVA management. These cost data are then aggregated for various levels of financial analyses.

Expected system income is generated from usage data multiplied by the applicable tariffs (which may reflect seasonal, water quality, or usage-level features), calculated fee income, and adjusted for billing collections. This expected utility income is then compared with utility expenses, resulting in the net income of the system. Various management decisions can then be made to change variables underlying utility income or expenses to see how this affects desired performance goals.

Ministry of Water and Irrigation Capital Cost

Following a JVA request, the debt service method was used to calculate the capital cost components of JVA projects. This method requires accounting for the interest expenses and principal yearly payments for each project. Both interest and principal is calculated for government loans, local loans, and international loans. Calculation is done for each cost center separately and is based on the value of loans, all interest rates applicable, and the payments schedule, which may reflect special grace period or interest-only provisions.

- **Interest.** Interest expenses include interest on amounts borrowed, and commitment interest on amount reserved by lender for the project but not used.
- **Principal.** Principal payments include all payments made during the year towards the principal of the loan.

CHAPTER FOUR

MODEL RESULTS

At the final policy/planning workshop with JVA in August 1998, various results of the FORWARD program's efforts were presented and discussed, including an assessment of current costs of the system and how costs, tariffs, and financial performance might vary under alternative future scenarios.

Current Costs

Several warnings are in order with respect to these cost estimates. The current JVA financial accounting system does not track operation and maintenance expenditures at a cost-center level. Therefore, it was necessary, for the time being, to allocate higher level directorate O&M costs back to the supply sources and system components, based on the professional opinions of JVA and FORWARD staff. Once a new financial accounting system is implemented, actual cost center information can replace these interim estimates. However, the average unit cost of irrigation water in the valley was not affected by cost allocation

Under the debt service method used in the model, capital cost is only accounted for when paid. Capital costs were obtained from the Ministry of Finance for outstanding debt service payments attributable to certain supply projects. The O&M and debt service capital costs were then converted to a unit cost basis using the average supply capability of the source. Some projects do not reflect a capital cost component because the debt has already been retired while others, such as the North Conveyor, were funded directly by the national government and a debt was not assigned.

Estimated Cost by Supply Sources

Table 1 reflects the estimated cost of supply for the year 1997 at various major supply sources within the Authority. Various projects, such as Wadi Arab, Karamah, KTR, and the North Conveyor, reflect the highest unit costs, primarily due to pumping or new debt cost. These resources also provide substantial supplies to the system. Some sources have zero debt service since they are financed by the government with national funds.

Table 1: Estimated Unit Costs for 1997 by JVA Major Supply Sources (fils/m³)

Source	O&M	Capital	Total	Source	O&M	Capital	Total
Yarmuk	1	0	1	Karamah	2	82	84
N. Conveyor	18	0	18	Shuieb	2	0	2
Mukheiba	1	0	1	Kafrein	6	6	12
Wadi Arab	16	30	46	Hasa, etc.	5	1	6
KTR	4	21	25	Wadi Araba	5	0	5

Allocated Costs to JVA Directorate

Table 2 reflects the allocated current O&M and capital costs for the JVA. These allocated cost totals include not only the spending of the Valley directorate itself, but also other costs allocated to projects within the directorate's boundary from the Central O&M, Dams, and Workshop directorates.

Table 2: Allocated Costs to JVA Directorates for 1997 (million JD)

Valley Directorate	O&M	Capital	Total
North	2.429	1.751	4.180
Middle	1.345	2.560	3.905
South	0.727	2.256	2.983
Southern Ghors	0.734	0.756	1.490
Total	5.235	7.323	12.557

Of the JD 12.557 million estimated annual water cost in 1997, the North Directorate accounted for about 33% of annual JVA water-related costs, followed by the Middle Directorate at 31%, the South Directorate at 24%, and the Southern Ghor Directorate at 12%.

The high cost in the North Directorate is attributed to the primary supply cost centers of the North Conveyor and Wadi Arab. This cost was not reallocated to the Middle and South Directorates.

Costs by System Components

Table 3 reflects the estimated current costs for the JVA by system component.

Table 3: Estimated System Component Costs for 1997 (million JD)

System Component	O&M	Capital	Total
Sources	2.002	3.807	5.809
KAC	0.653	0.532	1.185
Pumping	0.680	0.308	0.988
Secondary	1.899	2.676	4.575
Total	5.235	7.322	12.557

Of the JD 12.557 million estimated annual water cost in 1997, supply sources accounted for about 46% of annual costs, followed by the secondary delivery system at 36%, the KAC primary conveyance at 10%, and pumping stations at about 8% of annual costs. Capital costs currently financed by the government comprised 58% of the Authority's estimated 1997 full cost of water service; O&M expenses constituted the remaining 42%.

Costs at the Deir Alla Transfer Point to Amman

The estimated cost and possible price of JVA water at the Deir Alla transfer to the Water Authority of Jordan (WAJ) for Amman Governorate is of interest in the FORWARD analyses. In working with Ministry and JVA staff, FORWARD obtained agreement on what supply sources—primarily Wadi Arab Reservoir and the North Conveyor—should be reflected in the cost-of-service portion of this assessment. Consequently, Table 4 indicates the estimate of the basic cost of service—O&M plus debt service—for the water transfer at Deir Alla to be JD 1.414 million in 1997 or 37 fils per cubic meter.

JVA also requested that other considerations—beyond the direct cost of service—be included in the determination of a possible price of water, including:

- Having to carry the costs for the entire capacity of the North Conveyor and Wadi Arab Reservoir, which were constructed to address the reallocation of irrigation water to urban uses. Wadi Arab is currently used to regulate flows to the Deir Alla transfer;
- The additional costs of operating the KAC to maintain water levels and water quality at the Deir Alla diversion point;
- The opportunity cost of lost revenue to the JVA of not being able to sell the natural flows of Wadi Kufranja for irrigation due to WAJ wastewater effluent discharges and the need to route these flows out of the irrigation scheme to avoid contamination of supplies going to Deir Alla through KAC; and
- A place holder for possible consideration of a charge to help mitigate water quality impacts to JVA farmers in the middle and southern portion of their system resulting from degraded water quality from Amman effluent discharges into the King Talal Reservoir and the lower KAC system.

These additional pricing considerations totaled JD1.129 million in 1997 without water quality impacts considerations, or about 29 fils per cubic meter, bringing the total potential price of water—including O&M and debt service expenses—to 66 fils per cubic meter at the transfer point to Amman.

The Water Authority of Jordan does not necessarily concur with this pricing rationale, and the ultimate price will likely be subject to negotiation or high-level government decision.

Table 4: Estimated Cost and Possible Price of Transfer at Deir Alla for 1997 (million JD)

Item	Total
Cost of Service—O&M and Debt Service	
Supply Sources—Wadi Arab and North Conveyor	1.107
KAC Costs Allocated to WAJ—North and Middle Directorates	0.307
Subtotal	1.414
Other Considerations	
Wadi Arab Incremental Capacity	0.526
North Conveyor Incremental Capacity	0.431
Additional KAC Operations	0.051
Kufranja Lost Revenue	0.120
Water Quality Impacts	-
Subtotal	1.129
Possible Price Basis	2.543
Water Transfer	38.616 mcm
Possible Unit Price	66 fils/m³

Overall Unit Costs

Three informative concepts were examined in addressing the unit cost of water service. All of them used the same annual costs, but they differed with respect to the quantity of water used as the divisor in the equation.

- **The unit cost of supply available**—the total water quantity recorded from the sources that supply the JVA system. This water could be made available to JVA customers. Here the 1997 water-related expenses are divided by the water supply available in the JVA system, resulting in a unit O&M cost of 15 fils per cubic meter. When O&M and capital costs are both considered, the 1997 unit cost of supply available increases to 37 fils per cubic meter.
- **The unit cost of delivered water**—the recorded/metered water delivered to the customers including wadis water rights. Here the 1997 water-related expenses are divided by the water quantity delivered from the JVA system, resulting in a unit O&M cost of 26 fils per cubic meter. When O&M and capital costs are both considered, the 1997 unit cost of water delivered increases to 62 fils per cubic meter.
- **The unit cost of water billed**—the recorded/metered water billed to JVA customers. Here the 1997 water-related expenses are divided by the water quantity billed to JVA customers and WAJ, producing a unit O&M cost of 27 fils

per cubic meter. When O&M and capital costs are both considered, the 1997 unit cost of water billed increases to 66 fils per cubic meter.

To arrive at these varying measures, the reasons water was not sold were assessed:

- Some years there is supply that remains in storage and is not utilized until a later year.
- JVA may incur a cost of delivery in providing riparian water rights, but it cannot bill for the water.
- Unaccounted-for water in the system currently totals about 27% of the water released into the system.

This unaccounted-for is composed of both physical losses (primarily leaks, seepage, and evaporation) and administrative losses (no or poor metering, illegal connections, and inherent or addressable inefficiencies in systems operations). There was no reliable estimate of the relative contribution of these two factors contributing to the unaccounted-for quantities available at the time of the FORWARD efforts.

Current Revenues and Financial Performance

Tariff Structure, Billings, Collections, and Revenues

The current JVA irrigation tariff has been in place for several years and makes no seasonal, geographic or water quality distinctions. It is structured into four usage block charges, including:

Usage Level (m³)	Tariff (fils/m³)
0-1000	8
1001-2000	12
2001-3000	15
>3000	35

In 1997, 152.552 million cubic meters of irrigation water were billed by JVA, resulting in potential irrigation revenue of JD 3.212 million or unit revenue of 21 fils/m³. However, collections totaled only about 67% of irrigation water billed, resulting in irrigation revenue collected of about JD 2.152 million or a collected unit revenue for irrigation of about 14 fils/m³. Potential revenue from WAJ for the Deir Alla transfer totaled JD 2.543 million or a unit revenue for municipal raw water sales of 66 fils/m³, recovering both O&M and capital costs. However, the JVA does not receive any revenues from WAJ and this amount is considered to be inter-governmental transfer.

Overall Financial Performance

The JVA incurred an estimated operating loss of JD 2.803 million in 1997 given JD 5.235 million in annual operating costs and JD 2.432 million in collected revenue. The JVA only recovered about 46.5% of its operating costs. When capital (debt service) costs are also included, the cost basis increases to JD 12.557 million and the annual loss grows to JD 10.125 million. Thus full cost recovery was only 19.4% for 1997. To get a proper financial performance evaluation for JVA, we have to account for revenue from WAJ or allocate to WAJ its share of the cost.

CHAPTER FIVE

FUTURE FINANCIAL PLANNING SCENARIOS

Obviously, this level of financial performance is not desirable or sustainable over the longer-term. In order to evaluate alternative courses of action, benchmarks need to be defined. In the August 1998 workshop, the current condition and a defined “no action” future were specified as benchmarks for comparing various new action alternatives.

Scenario 1: No Action Future

- JVA will implement projects that are already initiated, such as the Mujib Reservoir.
- JVA will take no significant new actions to change tariffs, improve efficiencies, or change other management policies.
- However, inflation is likely to continue and costs increase, grace periods on existing debt service may expire and new debt service may be initiated.

System-operating losses grow to JD 4.097 million or 38.9% of O&M cost recovery by the year 2000. Overall losses would increase to JD 16.092 million or 13.9% of full cost recovery by the year 2000 considering both O&M and capital expenses

Scenario 2: Increase Tariff and Performance through Improved WAJ Collections until JVA Attains 100% O&M Recovery

- Increase the collection on billing for WAJ to 100% for the supply of raw water at the Deir Alla transfer.
- Increase the tariff, for irrigation water only, applying the same percentage of increase for all blocks for the period from 1998 – 2000 until JVA attains 100% of O&M cost recovery.
- Collections from farmers remain at current levels.

The irrigation tariff would increase 19% in 1998 and only 4% in the years 1999 and 2000, based upon the possible transfer price discussed above.

Scenario 3: Retain Tariff but Increase Performance through Improved Collections for WAJ and Farmers

- Increase the collection for WAJ to 100% for the supply of raw water at the Deir Alla transfer.

- Improve JVA collection from irrigation water sales to farmers to reach 90% billing collections.

JVA would recover 106.4% of O&M costs in 1998, but only 40.3% of full cost recovery (O&M plus debt service).

Scenario 4: Retain Tariff but Increase Performance through Improved Collections and 20% Staff Salary Cut

- Increase the collection for WAJ 100% for the supply of raw water at the Deir Alla transfer.
- Improve JVA collection from irrigation water sales to farmers to reach 90% billing collections.
- Reduce staff salaries for JVA staff 20% through attrition or lay-off.

O&M cost recovery increases to 121% and full cost recovery increases to about 41.9%. Improved collections appear to have much greater financial impact than efficiency policies which address staffing levels.

Scenario 5: Increase Tariff and Increase Performance through Improved Overall Collections

- Increase the collection for WAJ to 100% for the supply of raw water at the Deir Alla transfer.
- Improve JVA collection from irrigation water sales to farmers to reach 90% billing collections.
- Increase the tariff by 10%, for irrigation water only, and apply same percentage of increase for all blocks.

Under this scenario, O&M cost recovery increases to 111.8% and full cost recovery increases to about 42.4%.

Other Scenarios

The scenarios described above show some of the capabilities of the model. Various other scenarios were modeled and presented which illustrate further analytical capabilities of the model. These include addressing revenue and impact issues with seasonal and water quality tariffs. A further forecast was made of the provision for industrial, municipal/tourism, and irrigation uses in the pending Mujib project. The rather substantial revenue gain from this project's implementation and multi-purpose water sales would allow the Authority to attain full cost recovery of both O&M and debt service

expenses when coupled with the improved collection and staffing reduction described in Scenario 5.

CHAPTER SIX

MODEL COORDINATION, TRAINING AND TRANSFER

Coordination with JVA and Others

The FORWARD approach involves close coordination with stakeholders; early agreement on approach, assumptions, and methods; and continuing oversight to help assure ultimate buy-in and implementation of the study tools and recommendations.

This level of involvement was essential to the success of the JVA cost/tariff model efforts. The close working relationship began with the initial scoping efforts in April 1997. Agreements were reached at a multi-day workshop in August 1997 to jointly-define key issues. Day-to-day communications with JVA staff and regular monthly coordination meetings with an appointed JVA Technical Working Group followed. Senior officials with JVA and MWI were kept informed of the FORWARD efforts and results. These efforts culminated in two policy/planning workshops, in February and August 1998, when the results of the FORWARD efforts were reviewed and accepted.

Transferring Planning Capability to JVA

At the outset, JVA was asked to designate a person to operate and maintain the model for the Authority. A capable JVA engineer was assigned to be the “model operator” and was involved in the model development and coordination during the course of the efforts. Thus JVA was familiar with the model, its components, and data sources. In addition, FORWARD prepared an informative model users manual and conducted a two-day training workshop at the completion of the program activities. The aim was to further facilitate JVA capacity-building and transfer, use, and upkeep of the model. Several JVA staff attended the workshop.

JVA Financial Accounting System

During the course of the cost/tariff model building activities it became clear that the level of organization and system detail needed to evaluate various policy and planning issues could not be well supported by the current financial accounting system (FAS). While the current JVA FAS can produce aggregate and directorate-level cost information, this high level of available information impeded assessment of various discrete cost centers, cost allocations, and possible commercialization initiatives.

To address the need for more detailed and accurate financial accounting data, FORWARD prepared a proposal and has recently completed a scope design mission to develop an improved financial accounting system for the JVA. Once the full effort is funded and completed, the cost/tariff model will incorporate the improved data into the current and forecasted cost analyses.